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ABSTRACT

This report presents the results of an in-depth study of teacher supply and demand in the State of Maryland. The body of the report consists of seven parts: (1) a description of the purpose of the study; (2) a consideration of the limitations of the study; (3) a brief summary of national studies on teacher supply and demand; (4) a review of the supply and demand studies of several other states (e.g., Florida, California, Connecticut and Virginia) as well as previous Maryland studies; (5) a delineation of the methodology which was used, including assumptions, definitions, and data sources; (6) results and findings in the form of tables of data and interpretations of the data; and (7) recommendations and implications for the conduct of future studies and for policy in the areas of teacher recruitment, teacher education, teacher certification, and certification testing. (JD)

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TEACHER

SUPPLY AND DEMAND

IN

MARYLAND

(1986 - 1989)

Prepared by the Maryland
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INTRODUCTION

The following report seeks to accomplish several tasks. Primarily, it is a report on teacher supply and teacher demand in the State of Maryland. It also explores the implications of the relationship between these two aspects of personnel administration in an era of public concern about quality teaching.

On the supply side, data on the 1986 graduates from the state's college teacher preparation programs will be reported, and estimates of out-of-state emigres to Maryland will be predicted. Furthermore, projections on "returning staff" (last year's teaching force) and the "reserve pool" (persons who are certified to teach but who are not currently working as teachers) will be presented. On the demand side, the report will describe teacher vacancies by subject area. The data for this report were collected from local school systems and institutions of higher education in Spring 1986. Many factors which have short and long-term impact on supply and demand were examined for this report. Examples of such factors are: (1) policy changes which create need for more teachers; (2) certification requirements and teacher testing; and (3) mis-assignment, the practice of assigning a teacher to teach courses out of his/her certified areas.

I. PURPOSES

For several decades, educational policy-makers have used teacher supply and demand reports as a basis for making decisions about teacher staffing. These reports inform policy makers about the educational staffing needs of the state. The present report seeks to provide a comprehensive picture of Maryland's teaching force so that shortage areas may be identified and appropriate preventive action may be taken.

The main purposes of this report fall into four general categories: (a) contributions to state legislators and policy-makers; (b) contributions to policy makers in local school districts and in institutions of higher education; (c) contributions to officials in other states who seek to conduct teacher supply and demand studies; and (d) contributions to the field of teacher education and educational administration, especially to researchers who seek improved methodological approaches to predicting school staffing needs. These purposes are described in more detail below.

Contributions to State Legislators and Policy Makers

In Maryland, teacher supply and demand data provide the basis for the State Board of Education's declared areas of critical teacher shortage. Each year, the Supply and Demand Report is expected to guide the Board's selection of teaching fields which are in danger of being under-staffed. For example, in 1985, the Board declared four critical shortage areas: Mathematics, Science, Special Education, and Foreign Languages. Fifty-nine scholarships were provided for college students in Maryland who sought training in those shortage fields. Thirty of those scholarships were for Mathematics; eighteen were for Science (five for Biology, seven for Chemistry, one for Earth Science), and eleven were for Foreign Languages.

The Maryland State Department of Education uses the Report in several ways. A specialist in teacher recruitment, recently hired by the Department, develops programs and designs recruitment strategies which are targeted to shortage areas. Furthermore, the State Superintendent of Schools uses data from the report to inform the legislature.

The Governor and the Maryland State legislators who respond to bills about scholarship assistance, teacher salary supplements, and other teacher recruitment and training proposals refer to the annual report on teacher supply and demand. In fact, the 1986 General Assembly session produced legislation which was at least partially inspired by the results of the 1985 Teacher Supply and Demand Report. Chapter 712 (HB 180) provides for scholarships under the Teacher Education Tuition Assistance Program for teachers who agree to teach in a geographical area of the state identified by the State Board as less able than others to attract shortage area teachers. A Joint Resolution #11 (SJR 20) calls for the Governor to establish a Commission on Teacher Salaries and Incentives to examine the relationship between teacher quality/availability and teacher salaries/incentives. Furthermore, in their report on the budget, the Chairmen of the Senate and House budget committees requested "a comprehensive study of teacher supply and demand by MSDE."

Contributions to Policy-Makers in Local School Districts and in Institutions of Higher Education

Within the State of Maryland, local personnel directors need a statewide perspective in order to target their recruitment efforts to areas of greatest need. The Teacher Supply and Demand Report provides an important source of data for personnel officers. The report describes part of the annual teacher supply

by citing the exact number of graduates from Maryland's teacher training institutions by teaching field. It also gives each of the state's twenty-four districts an opportunity to see how many teachers are needed by neighboring districts. As a result, each district's recruitment efforts can be more clearly defined and recruitment trips can be tailored to areas of greatest need. Therefore, teacher recruitment activities may become more cost-effective. Deans and directors of teacher training programs at colleges and universities use the report as a basis for planning student recruitment and as one of the sources which direct their decisions about program expansion and/or retrenchment.

Contributions to Officials in Other States

As teacher supply and demand issues become more important and more controversial, a network of professionals, who are responsible for investigating these issues, is forming. The network consists of state educational agency staff and researchers from universities and consulting companies. These professionals learn from each other by attending national and regional meetings. They share methodological insights with one another. The results of this sharing is the improvement of the "technology" of assessing teacher supply and demand. The report seeks to further the goals of this professional network by conducting a study that is methodologically rigorous and is broad in its scope. Hopefully, the model of Supply and Demand which emerges from these pages adds breadth, depth and refinement to the existing state of the art.

Contributions to the Fields of Teacher Education and Educational Administration

The current scene at institutions of higher education is characterized by heated debates regarding the nature of teacher preparation. Some experts are suggesting that undergraduate teacher education should be abolished completely (Holmes Group Report, 1980). Others are claiming that current programs simply

must be modified to meet the needs of a new population of teacher candidates. Teacher supply and demand data, when analyzed properly, can help teacher educators decide about the need for overall program expansion or the need to expand course offerings in certain teaching fields. This report seeks to inform teacher educators about imbalances in teacher staffing within the State so that they may modify their programs accordingly and/or develop new programs that prepare new teachers for the complexity of a modern Maryland public school.

Finally, this report intends to reach a wide range of educational administrators who grapple with issues of supply and demand for principals, instructional supervisors and other categories of educational personnel. Hopefully, the process outlined in this report will provide a model which can be applied to a variety of settings.

II. LIMITATIONS

A supply and demand approach is at best an imperfect science. "Supply and demand" is a concept which may be applied to a wide variety of phonemena. It is useful in predicting fluctuations in markets for consumer goods and services. It can also be applied effectively to educational issues, but its greatest strength (i.e., its conceptual simplicity), is also its greatest weakness when applied to a complex phenomenon such as the staffing of schools.

Researchers, policy-makers, and professional educators agree that the supply and demand approach to making predictions about teacher staffing is somewhat unreliable. There are many traps into which the unsuspecting data-collector might stumble. (Little, A.D., 1965-1975; Huddle, E.W., 1973; Feistritzer, 1985; Darling-Hammond, 1985, 1986; "Teacher Supply and Demand in Florida," 1985; Cagampang, H., 1985; Cross, L.H., 1986; Prowda, P.M., 1986; Howley, W.D., 1986; and "Teacher Supply and Demand in Maryland," 1985).

Although a supply and demand study will reveal certain long term market trends, it is limited by the following factors:

The Influence of Publicity on Supply

Apparently, the very act of announcing a favorable job market produces a strong effect on that market. For example, when "teacher shortages" are publicized in the media, increased numbers of students begin to enroll in teacher preparation programs. Although this effect compounds the difficulty of accurate prediction, it is one about which policy-makers have mixed feelings, because it helps to balance the supply and demand equation in the desired direction. In other words, if educational policy-makers publicly predict a teacher shortage, they are gratified to discover that their public announcements have helped to solve the problem.

The Unit of Analysis Problem

No matter what the scope of the study, a decision about the basic unit of analysis to be employed will make some information more accessible and other information less accessible. On a national study, for example, generalizations about demand may be applicable to the nation as a whole but have very liitle validity when applied to a specific state such as Maryland. Local peculiarities, such as demographic patterns and socio-economic variables, will have a significant effect on teacher supply and demand. If the state is identified as the basic unit of analysis, the findings may or may not be applicable to a given local jurisdication. Furthermore, extreme patterns in one local area may convey a misleading picture of the whole state. For example, if Baltimore has an extreme teacher shortage and Kent County has a "surplus," the state figures will reflect demand at a somewhat lower level than Baltimore's and at a higher level than Kent's. Thus, local officials can use state and national studies as reflections of long-term, global trends, but should be cautious when applying the findings to their particular systems. They must conduct their own research in order to have accurate data for purposes of teacher hiring.

Policy-makers, however, can use the information from a statewide supply and demand study to make state scholarship decisions, develop legislative programs, and implement strategies which prevent crises and slow down trends. For example, the Maryland Supply and Demand Study of 1985, despite its limited applicability at the local level, was a helpful vehicle for forecasting subject area shortages and highlighting the diminishing supply of in-state graduates from institutions of higher education. It could not, however, provide accurate detailed information about each of the twenty-four local education agencies.

The Systemic (i.e., Interrelated) Nature of Teacher Supply and Demand The difficulty of producing data which enables a local school administrator to make rational staffing decisions is exacerbated by the fact that demand actually creates supply and supply affects demand. When there are desirable jobs available, people seek the training and/or preparation to qualify for them. When the supply is abundant, employers do fewer things to attract and retain qualified candidates. Each of these reactions affects the overall supply and demand picture.

When examining teacher supply and demand, one must remember that to some extent imbalanced supply and demand situations will appear to become balanced by themselves. However, there are many factors on the current scene of teacher education and certification which exert strong influences on this natural rebalancing (Hawley, 1986). First of all, teachers and teacher educators are successfully convincing politicians and the public that "quality" of teachers is at least as important as "quantity." Therefore, at this writing, twenty-nine states have implemented teacher testing programs. Also, many states have resisted creating "alternative certification" programs despite impending shortages. The Carnegie Forum's report (1986) and the findings of the Holmes Group (1986) both point to the need for longer and more rigorous training of teachers and stricter selection criteria. All of these movements toward higher quality will tend to slow down the natural swing of the supply and demand pendulum.

Another aspect of the "systemic" nature of the teacher supply and demand is the fact that each state is an "open system" with respect to teacher staffing. In other words, teachers enter and leave the state at will. It is very difficult to predict the extent of this emigration-immigration process.

As demand increases, local school officials often become more aggressive about seeking out-of-state candidates. A recent article in Education Week (June 18, 1986) cited many examples of states with shortages seeking teachers from other states and from abroad.

Effect of Federal, State, and Local Policies on Supply and Demand.

In addition to teacher testing and certification requirements, there are many other policies which may significantly influence teacher supply and demand. Federal legislation regarding Special Education and Bi-lingual Education has already made a strong impact. Many states (e.g., California, Virginia) report their greatest "shortages" in those two areas.

State policies about graduation requirements may also affect the local demand for teachers. As high school students are required to take more courses, classes will either increase in size (i.e., higher student-teacher ratios) or more teachers must be hired. Where class size is limited by contract, enrollments remain constant or are increasing, and high school students are required to accumulate more credits for graduation, the size of the teaching force will almost certainly increase.

At the local and state level, policies which permit early retirement may influence teacher supply -- especially in states, like Maryland, with an aging population of teachers. Furthermore, prohibitions against "misassignment" (i.e., teaching out of one's certified field) will tend to increase the number of teacher "vacancies" in a school system. The growing number of requests for pre-kindergarten programs will also tend to increase demand.

The Impact of Demographic Trends

There has been much discussion recently about a "baby boomlet." According to demographers (1980 Census), children entering kindergarten in 1985 represent the vanguard of a swelling enrollment trend. According to a report which was prepared by Maryland's Department of Fiscal Services in December, 1985, the enrollment of students in grades K-6 will increase by almost eleven percent between 1985-1989. On the other hand, there is a predicted decrease in enrollment in grades seven through twelve. The other demographic pattern which may affect teacher supply and demand is the general "greying of the American population. The national teaching force is a reflection of this trend. Nationally, the median age of teachers is thirty-nine. In 1976, it was thirty-three. Maryland statistics are consistent with this national trend.

The Influence of Socio-Economic Factors

Many recent studies have indicated that two previously dependable sources of high quality teacher supply are now dwindling. One of these is young women. Reportedly, when presented with opportunities for careers other than teaching, young women are pursuing these fields. Women are seen in greater numbers than ever before in previously male-dominated law schools, medical schools, departments of engineering, and departments of management. In fact, some writers suggest that the "best and brightest" of the women are seeking non-education careers because of the poor image, stressful conditions, and low salaries which are associated with teaching.

Another traditional source of teacher supply has been a population of talented, college educated minorities, especially black Americans. Teaching has been a respected profession in the black community and has been one of the few paths available to black people who seek an improvement in their socio-economic

conditions. Today, with a wider range of career paths open to blacks and other minorities, they are choosing occupations other than teaching. According to a recent news interview with personnel and college officials in Florida and Washington, D.C., black candidates for teaching jobs are "...just not there". According to Shirley Fields, assistant to the dean for academic affairs at the University of the District of Columbia's College of Education "the districts are begging for black candidates." (Education Week, June 18, 1986)

Another global factor which influences teacher supply and demand is the attraction of math-proficient people to computer-related fields rather than to teaching. There also appears to be a similar trend in the sciences. Students with high ability in math or science are choosing higher-paying "high-tech" jobs rather than going into teaching.

It is very difficult to project the direction of these socio-economic trends and their impact on teacher supply and demand.

In sum, it is necessary to consider and to "factor in" as many of the above phenomena as possible in a study of teacher supply and demand, but some of them do not lend themselves readily to numerical quantification. They can be used, however, as a guide to interpreting numerical results. For example, if in-state supply has shown a small but steady decrease over the past few years, it is instructive to note that the supply of teacher education graduates nationally has been dwindling and that there are several powerful social and economic factors which are tending to push those trends further in that direction. By understanding the social and economic factors which play a role in supply and demand, the policy-maker is able to recognize the degree of severity of the situation.

III. NATIONAL PERSPECTIVE

There are several recent sources of data which are cited frequently by researchers on national teacher supply and demand. The three which are most consistently cited are: Emily Feistritzer's reports, (1) The Condition of Teaching: A State by State Analysis, commissioned by the Carnegie Foundation for the Advancement of Teaching (1983); (2) The Condition of Education, commissioned by the National Center for Education Statistics (1985), and (3) Linda Darling-Hammond's papers for the Rand Corporation in Washington, D.C. (1984, 1986). For more of an historical perspective, writers refer to NEA's Teacher Supply and Demand in Public Schools reports of the sixties, seventies and early eighties (before these reports were discontinued).

Emerging from these reports is a picture of teacher supply which alternately dips and peaks, creating "teacher surplus" and "teacher shortage" conditions. In general, shortages are created when one of the following conditions prevails: (1) supply is relatively constant and demand is high because of rising enrollments, stable pupil-teacher ratios, and the proliferation of well-funded programs (e.g. in the sixties); (2) demand is relatively constant and supply is low because of dwindling enrollments in teacher education programs and high rates of attrition.

In The Condition of Education (1985), Feistritzer displays in a table the national trend of decreasing supply and increasing demand for teachers, 1980-1993.

(See Table 3.1)

Table 3.1

Past and Projected Trends in Estimated Demand for Classroom Teachers in Elementary/Secondary Schools and Estimated Supply of New Teacher Graduates: United States, Fall 1980 to Fall 1993

(Number in Thousands)

Fall of Year	Total Estimated Teacher Demand	Estimated Demand for Additional Teachers					Estimated Supply of New Teacher Graduates[1]	New Supply as Percent of Demand for Additional Teachers
		Total	Public	Private	Elementary	Secondary		
1980	2,463	134	110	24	76	58	144	107 5
1981	2,430	115	85	30	71	44	141	122 6
1982	2,445	161	130	31	107	54	143	88 8
1983	2,462	164	132	32	98	66	146	89 0
					Projected[2]			
1984	2,457	143	120	23	84	59	146	102 1
1985	2,467	158	134	24	96	62	146	92 4
1986	2,483	165	139	26	109	56	144	87 3
1987	2,509	171	144	27	125	46	142	83 0
1988	2,517	162	140	22	124	38	139	85 8
1989	2,543	177	146	31	130	47	139	78 5
1990	2,580	188	160	28	136	52	139	73 9
1991	2,630	204	176	28	138	66	138	67 6
1992	2,687	215	181	34	135	80	137	63 7
1993	2,737	211	175	36	125	86	133	63 0

[1]Estimates for 1980 and 1981 are from National Education Association, *Teacher Supply and Demand in Public Schools, 1981-82*, 1983. Other estimates developed by the National Center for Education Statistics.

[2]For methodological details, see *Projections of Education Statistics to 1992-93*, 1985.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Projections of Education Statistics to 1992-93*, 1985, and unpublished tabulations (January 1985); and National Education Association, *Teacher Supply and Demand in Public Schools, 1981-82*, 1983, copyrighted.

p. 144

Although "relatively few" vacancies existed nationwide in 1983, Feistritzer commented:

> Over the next 10 years, when the supply of new teachers is projected to fall considerably short of demand, unfilled positions may become more apparent and confront school officials with difficult choices. (p. 138)

She characterizes the national picture for the decade in the following excerpt:

> The enrollment upswing projected for the latter half of the 1980's in elementary schools is expected to generate demand for additional teachers. This increased demand should reach the secondary level after 1990. Paralleling the need for sufficient numbers of teachers in the next 10-15 years is the concern expressed by many national experts that teachers be of adequate quality. (p. 137)

The conclusion to Feistritzer's section on Teacher Supply and Demand summarizes the national situation for the eighties:

> In 1983, teacher shortages appeared limited to certain fields and locales. If assumptions used to project future supply and demand prove accurate, the next decade will witness more prononunced teacher shortages nationally as well as within specific localities and specializations. Growing concern about the qualifications of teachers is linked to the problem of dwindling supply. Not only are insufficient numbers of teacher candidates a likely possibility but those available may not be the best qualified. Determining whether those incentives currently available to those who seek a career in teaching will be sufficient to moderate these outcomes can only be speculative at this time. Nevertheless, a major challenge for educators in the next decade will be addressing the balance between the forces of teacher supply and teacher demand through a reassessment of the incentives afforded by careers in teaching. (p. 138)

In Linda Darling-Hammond's report for the Rand Corporation (July, 1984), teacher supply and demand is examined from the standpoint of "quality" as well

as "quantity." She refers to: "...changes in the recruitment and retention patterns of the American teaching force, in the quality of teachers, and in the attractiveness of teaching as a profession."

Based on a survey which assesses teachers' attitudes about teaching as well as demographic data about teachers, Darling-Hammond concludes that a general shortage of teachers is imminent. She examines teacher attrition rates, ability and qualifications of teachers, school age population trends, and levels of teacher satisfaction as factors which contribute to the impending shortage. The graphs on pp. 16-20 demonstrate her conclusions.

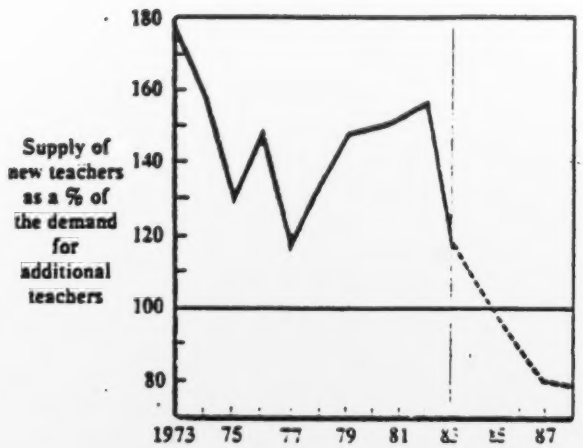
She summarizes by describing several trends and factors which will influence teacher supply and demand for the next decade:

> Shortages of qualified teachers in subject areas such as mathematics and science are expected to grow over the next few years into a more generalized teacher shortage as enrollments increase and the supply of prospective teachers continues to shrink. (p. V)
>
> ....new recruits to teaching are less academically qualified than those who are leaving, and the number of new entrants is insufficient to meet the coming demand for teachers. The most academically able recruits to teaching leave the profession within a very short time...
>
> Demographic trends are provoking supply and demand imbalances. More significantly, though, academically talented women and minorities...are now choosing other occupations... (p. V)

The Rand Corporation's most recent attempt to study national teacher supply and demand is presented in a working draft of a report entitled, "A Conceptual Framework for Examining Staffing and Schooling" (Darling-Hammond, Haggstrom, Hudson and Oaks, April, 1986). Its goals are ambitious. It seeks to improve

upon previous supply and demand studies by expanding the scope to include factors beyond the annual pipeline of graduates from teacher training institutions and the number of annual teaching vacancies which are reported by personnel directors of school systems. In the category of "key components of teacher supply and demand," they include factors such as: new graduates, entrants from non-teaching occupations, former teachers and continuing teachers. They also examine attrition rates of teachers in terms of factors such as: switches to non-teaching occupations, retirements, deaths, disability, and emigration. Although this project is still in the preliminary stages, it promises to be a model of national teacher supply and demand for years to come. The framework which is used in the Rand report expands the definition of supply and demand to include: trends in school programs, curricula and staffing arrangements and school policies and practices which influence " characteristics of school personnel and important features of their work." Although the report will be a model of a process which individual states may seek to emulate, it has limited utility at the local level. Because it uses the nation as its basic unit of analysis, the data which is collected in this study may not accurately reflect the teacher staffing situation for any <u>particular</u> state.

The Rand Corporation's model for this study appears on p. 21.



A General Shortage of Teachers Is Imminent

Academic Ability of Incoming Teachers Is Declining

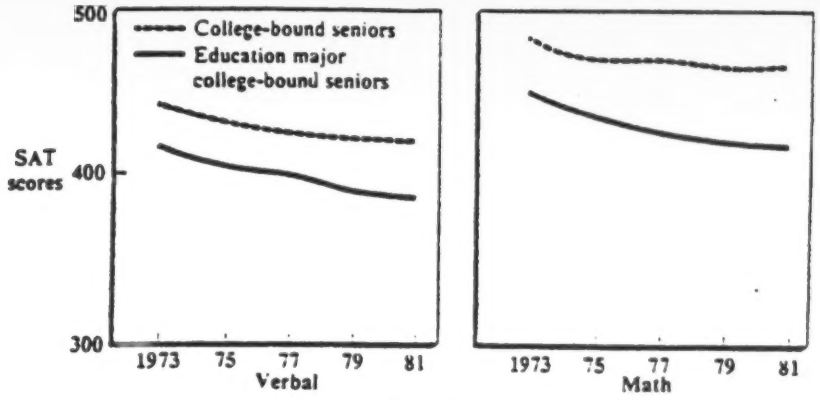


Chart 1

Attrition Rates of Teachers

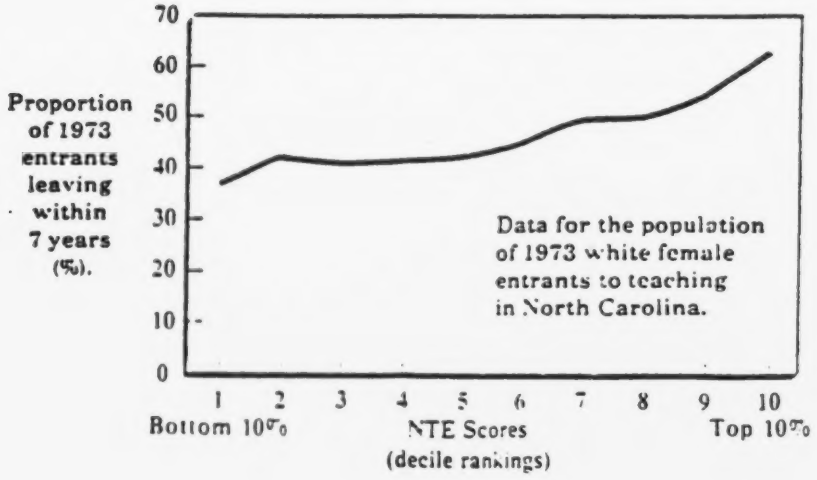
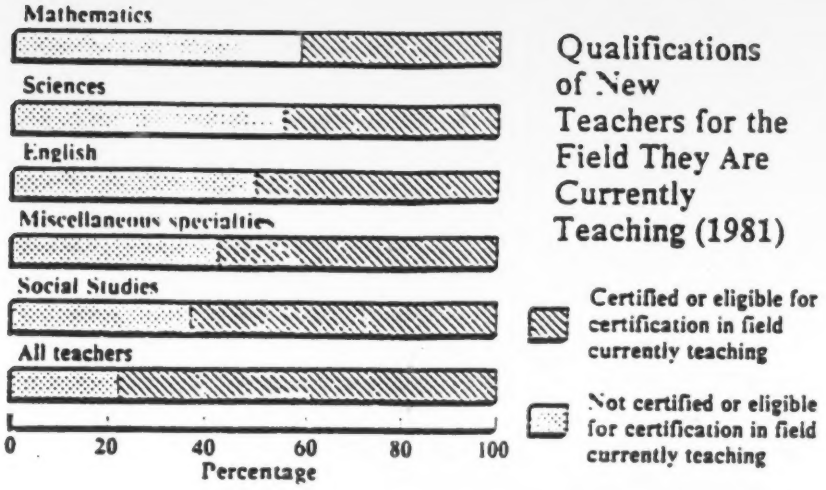
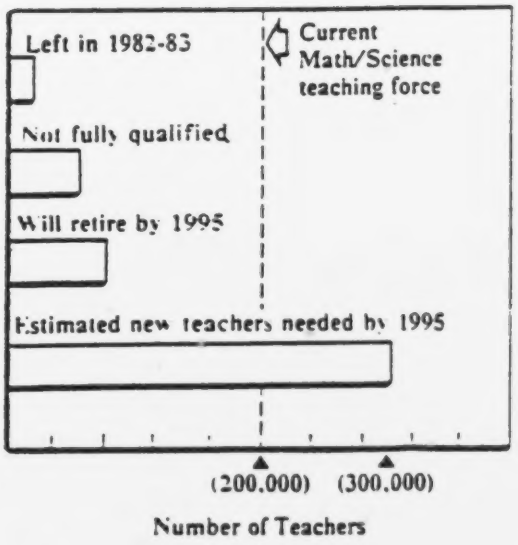


Chart 2

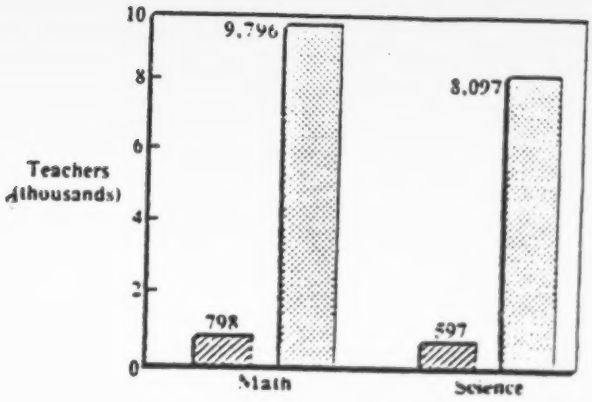


Qualifications of New Teachers for the Field They Are Currently Teaching (1981)

Chart 3



Status of the Mathematics and Science Teaching Force

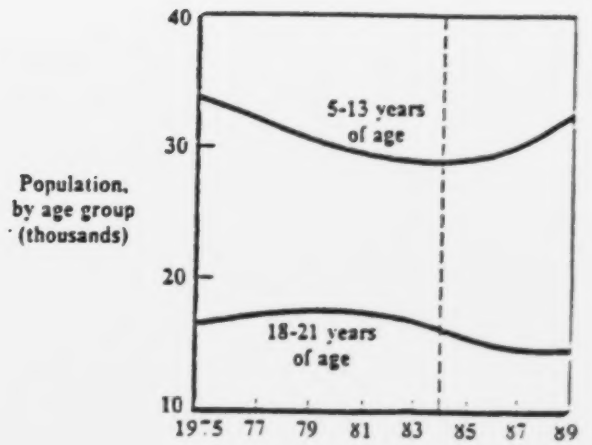


Math and Science Teachers: Entrants and Attrition

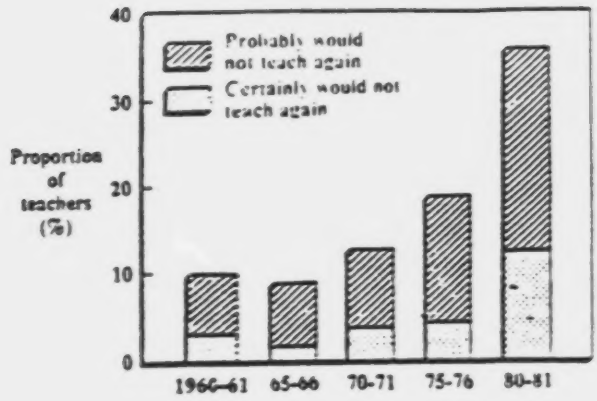
New teaching graduates, 1981

Left 1982-83

Chart 5

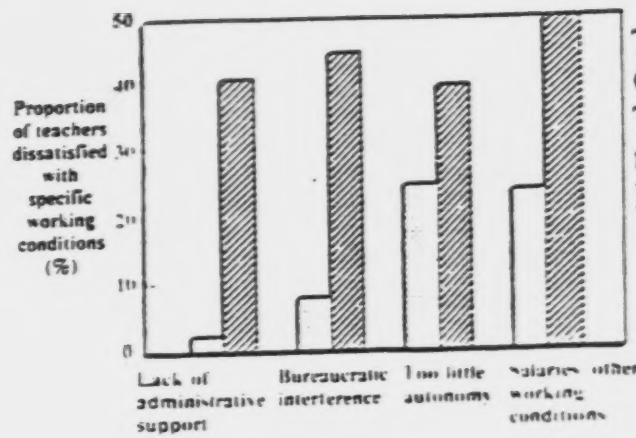


School-Age Population Trends



Percent of Teachers Who Would Not Teach Again — Teacher Dissatisfaction Has Increased...

Chart 10

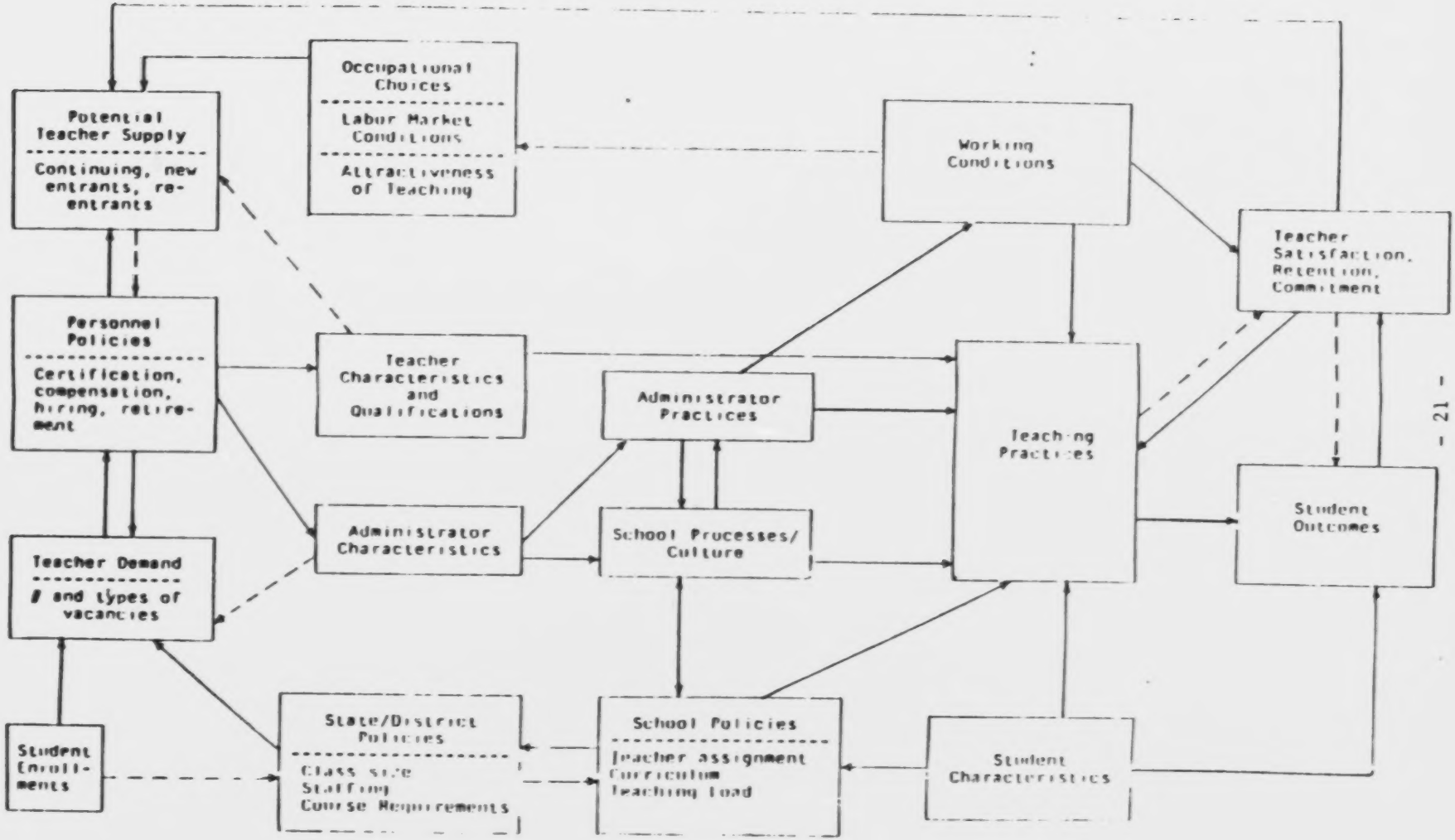


The Best Qualified Teachers Are the Most Dissatisfied

MODEL of RAND CORPORATION'S

CONCEPTUAL FRAMEWORK FOR

EXAMINING STAFFING AND SCHOOLING



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IV. STATE BY STATE STUDIES

There does not appear to be a generally accepted method of conducting teacher supply and demand studies or for reporting their results. Each agency adopts a format and methodology to suit its purposes and needs. More and more states, however, are producing annual reports to inform the public, legislators, and policy makers of staffing trends for the future.

For example, the October 1985 "Teacher Supply and Demand In Florida" report is the fourth annual attempt to assess systematically that state's need for teachers. It includes tables of projected vacancies (1982-1984) by major subject fields and discussions about changes in staffing patterns, especially for Dade County, a large school district which shows unusual patterns of demand. Tables in the document provide the following information: (1) estimated number of vacancies by subject field (1983); (2) certification status of teachers who filled vacancies in 1984 (by subject field); (3) district by district analysis of 1984 vacancies in terms of those being filled by an "in-field" placement, an "out of field" placement, or vacancies remaining unfilled; (4) number of graduates of teacher education programs in Florida (by field); (5) long and short term projections (1989-2001) of demand for teachers by subject field; (6) expected attrition of teachers compared with projected need for teachers due to enrollment growth and attrition.

Florida's population reflects interesting demographic characteristics. According to this report and prior reports, the most important factor affecting supply and demand in that state after 1986 is the shift in the age distribution of the population. The state is becoming younger and younger. Forecasts indicate enrollment increases of 30,000 - 50,000 a year (1985-1990), while the

pool of 22-24 year olds will decrease by 11%. Beyond 1990, the potential teacher pool will continue to decrease in size while enrollments continue to increase. Many states face a similar, although not quite so dramatic, pattern.

The Florida report writers conclude that the long-range teacher supply and demand picture in that state looks bleak. A "serious teacher shortage" over the next fifteen years is projected for Florida.

In Virginia, Larry Cross of Virginia Tech presented a report to the Virginia State Board of Education on February 25, 1986. In it, he examined three indicators of demand in forty-two teaching areas. He also assessed the impact of the National Teachers Examination, recently mandated in that state as a requirement for new teachers.

Cross defined demand as the total number of teachers hired each year. He also considered: (1) the percentage of the total work force newly hired each year (i.e., the turnover rate when there has been no increase or decrease in the size of the work force) and (2) the percentage of the newly hired who had teaching assignments for which they were not endorsed (i.e., teachers teaching "out-of-field"). By using the newly-hired percentage and the out-of-field percentage, Dr. Cross portrayed a more accurate picture of demand than he would have gotten by considering filled vacancies alone.

The Virginia report's definition of supply is: "those persons who were required to submit NTE scores as part of the application for certification." This is an approach which several states are beginning to use. Connecticut, for example, uses "first certified" teachers (Prowda, P.M. & Grissmer, D.W, 1986) as a definition of supply rather than using graduates from teacher education programs, an approach used by Maryland and other states in previous years. This limits Virginia's definition to supply of "inexperienced applicants for initial certification." Dr. Cross laments the fact that this definition is inadequate

because almost fifty percent of all teachers hired in Virginia are "veteran teachers." He claims that "there is no way" to estimate the total potential pool available.

Although the findings of the Virginia study are preliminary, six areas were identified as teaching fields in which demand seems likely to exceed supply: (1)Pre-school Special Education, (2) Learning Disabilities, (3) Emotionally Disturbed, (4) Earth Science, (5) Physics, and (6) Health/Physical Education.

Dr. Cross also devoted considerable attention to the impact of the NTE on the ethnic and racial composition of the teaching force. He cautioned readers against misinterpreting the function of these scores and suggested that the test may discriminate against black candidates.

The Connecticut report, conducted jointly with the Rand Corporation, concluded that Connecticut does not have a general shortage of teachers, nor is one expected in the near future.

Connecticut used "first certified" teachers as an indicator of supply. Demand was assessed by integrating: (1) estimated staffing requirements, (2) age and subject area attrition data, and (3) age and subject area hiring data. It was assumed that pupil-teacher ratios in elementary and special education would remain constant. In order to estimate staffing requirements for secondary schools, several factors were considered: (1) declining enrollments at that level, (2) increased graduation requirements, and (3) a decreasing pupil-teacher ratio.

Two scenarios for future supply were generated by the writers of Connecticut's report. These scenarios took into account a wide variety of factors which may influence Connecticut's supply of teachers: the impact of the age of those who are first certified, the changing population, the reserve pool,

the number of degrees awarded in education, students' intent to study education, parents' attitudes about their children becoming teachers, in-state teacher salaries, salaries of neighboring states, testing of prospective teachers, and the state's scholarship/loan program for education majors.

The scenarios described the status of teacher supply in 1990. There is an "optimistic" scenario and a "pessimistic" scenario. Even in the pessimistic scenario, the supply of newly certiied teachers is expected is exceed the projected demand for new teachers in "most subject areas" (p. 28).

The Connecticut report was criticized by some attendees at a recent national meeting of the American Educational Research Association (San Francisco, 1986) as relying heavily upon too many unpredictable elements (e.g., teacher salary fluctuations and the "reserve pool").

The writers of the report admit that one of the limitations of the methodolgy was inattention to supply questions such as the qualifications of first certified teachers and their location within the state. They conclude with the following statements:

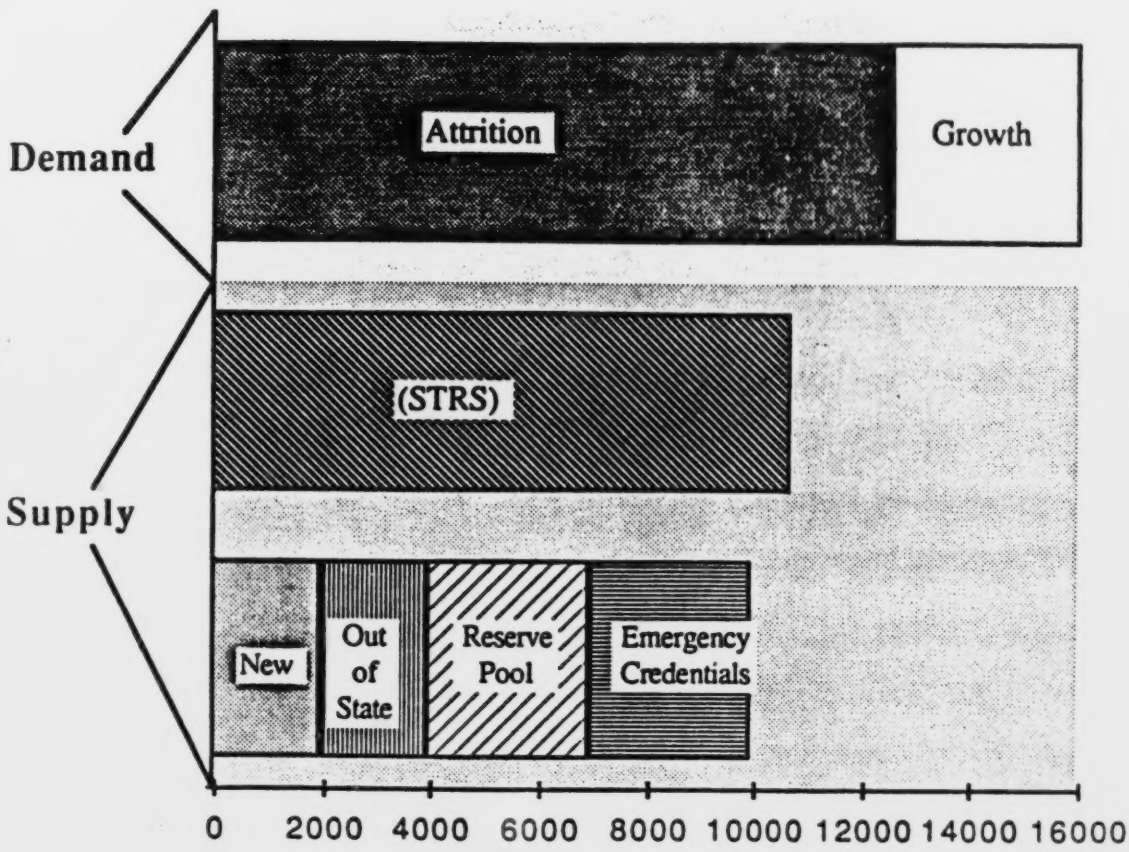
> This report has dealt extensively with the quantity of supply and has touched only lightly upon the issue of quality. More research is needed to address the question of the location of the supply and the quality and availability of teachers in the reserve pool.
> (p. 28)

California, one of the states which has been suffering from a shortage of qualified teachers, has published a recent supply and demand report which outlines projections to 1989-1990. The report describes the shortfall of teachers in terms of "best case" and "worse case" scenarios. The best case scenario projects a shortfall of twenty-one thousand teachers by 1990. The worst case

shortfall is 35,000. These figures are dervied from statistical projections. Two sets of projections are presented in the California report. One set assumes that certain educational policies will remain constant (e.g., pupil/teacher ratios will remain the same, "emergency" certificates will be issued at the same rate, and teachers will continue to teach outside of their areas of expertise. The second set of projections assumes certain educational "improvements" (e.g. pupil/teacher ratio will be reduced to twenty to one, no emergency credentials will be issued, and teachers will be allowed to teach only in their fields of expertise). Although projected shortages based on the first set of assumptions range from 21,000 to 35,000 teachers, those which are based on the second set of assumptions range between eighty and ninety thousand teachers. Naturally, California policy-makers are concerned over this impending crisis in teacher supply. The chart on page 27 demonstrates the California model for defining supply and demand.

In Maryland, teacher supply and demand data have been collected since 1968. In recent years, these data have provided the basis for scholarship decisions by the State Board of Education. Based on reports from Maryland's twenty-four local school systems and twenty teacher training institutions, the Board has declared "critical shortages" in several subject areas. In 1985-86 these areas were mathematics, science, foreign languages, and special education. The most recent (1985-86) Maryland report suggests that early childhood/elementary education may also become a shortage area in the State.

Sources of Teacher Demand for 1985-86
Two Methods of Projecting Supply



STRS -- State Teachers' Retirement System

In the 1985 teacher supply and demand study, supply was defined as "those students already in the pipeline" (i.e., graduates, seniors, and juniors) in Maryland colleges and universities. Deans and directors of teacher education were asked to provide an estimate of the number of students enrolled in and expected to graduate from, teacher education programs in 1985, 1986, and 1987. This information was collected by subject area.

Demand was defined as the actual number of teachers hired during the 1984 hiring session and the number of new teachers the directors of personnel expected to hire in 1985, 1986, 1987 and 1988 -- "the anticipated demand for new teachers." Demand data were also collected by subject area.

The methodology of the 1985 study was a comparison between estimates of numbers of students in the state pipeline and the sum total of estimates of vacancies which were reported by each local educational agency. This methodology has a number of limitations. Several of these are cited by the report writers. First of all, for the purposes of this study, the number of graduates of out-of-state programs who come to teach in Maryland is not specified At that time, data about numbers of Maryland grads who seek teaching positions out-of-state and numbers of out-of-state teachers who seek jobs in Maryland was inaccessible.

A second source of supply, persons who become certified by credit count, (i.e., bachelors degree holders in fields other than education who subsequent to graduation take education courses required for certification), was also impossible to predict accurately when the 1985 report was written. Although the data base currently available to the Maryland State Department of Education makes this information more accessible, report-writers in 1985 had to content themselves with rough estimates. The third source of supply, persons certified

to teach who are not currently working as teachers (i.e, the "reserve pool" has defied quantification by report writers in Connecticut, Virginia, Florida, California, and other states. For the purposes of Maryland's 1985 study, this pool was referred to as a "major factor with respect to the supply of new teachers" because Maryland experienced many years of an "over-supply." Based on recent trends, it is probably safe to assume that the reserve pool will dry up over the next few years. For example, Ohio, a state which recently was producing a "surplus" of Math teachers, is now claiming a shortage in that teaching field. Out of state recruiters, an Ohio state educational official claims, have attracted their "surplus" to other states.

The 1985 Maryland report begins with a short narrative dscribing the intent of the report -- providing data for the State Board of Education to fulfill its obligation to the Teacher Education Tuition Assistance Program. It continues with a brief description of the methodology and an analysis of results. Three tables display the annual anticipated demand (Tables 1 and 2) and the annual anticipated supply (Tables 3 and 4) for 1985-86. Actual hiring figures for 1983 are also included. The tables are displayed by subject field. Year by year and cumulative deficit/surplus figures are also provided in the report.

In conclusion, the document lists the following "additional factors to consider:"

1. Deans are reporting actual graduates, or people in the pipeline;
2. Directors of personnel are reporting actual hires and anticipated new hires two years hence;
3. Directors of personnel have reported conservative figures in previous reports;
4. Some college students may not graduate;
5. Experience shows about 70 percent of teacher education graduates actually become teachers;
6. Directors of personnel made no allowance for personnel who move from one Maryland school system to another;
7. National and some state reports project a shortage of teachers;

8. Some states report no shortage except for mathematics and the sciences.

One page of implications was also included in the report. Those are listed below:

1. Teaching must be made more attractive;
2. Salaries must be improved
3. Work conditions must be improved;
4. Supply and demand information must be shared with directors of personnel to verify accuracy;
5. Supply and demand information must be shared with deans to encourage teacher education enrollments to increase

The present study seeks to expand and elaborate upon these implications. See section seven for details.

Additional limitations of the methodology which was used for the 1985 report are: (1) the absence of significant demographic information such as the median ages of teachers, which might have short and long term implications for supply; (2) the absence of out-of-field teaching data; (3) the lack of attention to factors such as geographic location, policies, and working conditions which affect the size of the pool of new teachers and the attrition rates of newly employed teachers; (4) the impact of state policies, such as new high school graduation requirements and the National Teachers Examination on supply and demand.

The general findings of the 1985 Maryland report are consistent with findings in many other state studies and in national studies conducted by Rand, NCES and others. Overall, the pool of graduates from Maryland teacher training programs in certain fields is shrinking while public school enrollments, especially at elementary and early childhood levels are gradually increasing. This does not necessarily imply a critical shortage of teachers across the board, but it gives cause for concern. If Maryland follows the national

pattern, its urban areas will be hit the hardest by the teacher shortage. Rural areas and subject fields which require high levels of training, such as computer education, certain math and science fields, and programs in special education will also reflect shortages. Thus, the findings of the 1985 report which predict a cumulative shortfall of 6000 teachers (i.e., the difference between 9000 anticipated vacancies and 3000 expected graduates from Maryland programs) from 1985-1987 should be treated seriously. That figure, however, needs to be examined more closely in light of the limitations of the methodology which was employed and in light of a number of other factors which the present study explores in more detail.

V. METHODOLOGY

Overview

The 1986 report on Teacher Supply and Demand in Maryland expands the focus of previous efforts within this State and seeks to benefit from the experiences of other states, as well. This study is based upon a model which was developed by personnel from the Maryland State Department of Education's Research, Evaluation, and Statistical Services Branch, the Division of Certification and Accreditation, and the State Board for Higher Education.

The Maryland teacher supply and demand model was developed to meet several objectives. The objectives were to provide:

1. a long term system of data collection which yields annual information on teacher supply and demand;
2. a system that can be annually validated (compare projections with actual occurrences), updated and improved;
3. data that are sensitive to long term demographic changes in the age distributions of teachers and students;
4. data components that can be integrated, or linked, so that meaningful comparisons can be made within and between supply and demand; and
5. accurate and timely data useful for policy/program planning at the state level.

The model was conceptualized as consisting of additive components. The components were developed through a literature review of other state and federal supply and demand studies and a series of meetings between Maryland State Department of Education and the State Board for Higher Education staff.

In addition to the model, certain assumptions are implicit in the report. The most important assumption is that in order to tally and compare supply and demand estimates one must attempt to define a "legitimate" supply and demand. For this reason, conservative definitions are used for both supply and demand. For example, the instate "pipeline" is defined as the number of graduates of Maryland colleges who will actually teach in Maryland. This is different from previous studies which used a liberal definition of the instate "pipeline" (e.g. the number of graduates from Maryland colleges who were majoring in education).

Another corollary to this assumption is that teachers are not treated as interchangeable in the report. For example, it is assumed that teachers certified in Math are not part of the supply for English or Special Education. In other words, writers of this report have attempted to avoid the "warm body" theory of teacher shortage.

Another corollary to the "legitimacy" assumption is that teachers who are misassigned (i.e., teaching classes outside of the teacher's field of certification) should be considered as part of the demand rather than supply. These individuals may be considered temporary fill-ins for positions which still need to be filled by certified teachers. For purposes of this study they were counted as part of supply. In the future, they should be viewed on the demand side of the equation.

Hopefully, the model which has been developed for this report will become the cornerstone for an assessment process which permits policy makers to anticipate short term needs and to predict long term trends in teacher supply and demand for the State of Maryland.

Supply Projection:

The 1986-1988 projections of supply began with the actual supply during the school year. The 1985-86 data was obtained from the Maryland State Department of Education staff data base. The teaching staff was categorized by certification areas. The staff was then classified as returning staff or new hires. The new hires were separated into beginning teachers (in-state and out-of state reserve pipeline) and experienced teachers (in-state and out-of -state reserve pool).

Projections for the in-state pipeline were based on a survey sent to deans and directors of teacher education in the twenty institutions of higher education (IHEs) which have approved teacher education programs in Maryland. The Maryland State Department of Edudcation staff data base was also consulted. The data base provided the number of new hires who were graduates of Maryland IHEs, and the survey provided the total of number of teacher education program graduates from Maryland IHEs. The ratio of the two numbers was used as an estimate of the rate of graduates that are actually hired (See Table 11). The rate was then used to project the in-state pipeline from 1986-88. The projection assumed that the percent of graduates which are actually hired would remain relatively constant from 1986 through 1988.

All other projections of supply were based on predicting the number of new hires. It was assumed that the annual increase in the total number of new hires from 1986 through 1988 would equal the average number over the past two years (approximately 344 teachers per year). Totals of new hires were then distributed across certification area; new hires were distributed proportional to the 1985-86 frequencies. This procedure is based on the assumption that the "share of the market year" would be the same from 1986-88.

Demand Projection

The projection of demand was based on a survey sent to Maryland local school system directors of personnel. Directors were asked to predict the number of teachers they expected to hire (by subject area) each year from 1986 through 1989 The subject areas were subsequently organized into certification areas and used for demand projections.

Several definitions were used for the purpose of this study. The school year was defined as the time interval of September through June. A "new hire" was defined as a permanent (not temporary or substitute) teacher contracted to teach for either the entire or part of the school year. Teachers who signed contracts prior to the start of the school year were also included if they fulfilled their contracts by actually teaching.

Full-time teacher equivalents (FTEs) were not included in either definition. This resulted in slightly more teachers appearing in the study than are indicated in other Maryland State Department of Education statistical releases.

Other Factors

There were some factors not included in the study that undoubtedly affect the projections. The first is that it is known that there are a considerable number of misassignments in Maryland. These were included in the teacher supply but should probably be considered in the teacher demand because the misassignments represent positions which still need to be filled by qualified teachers.

A second factor which was not considered relates to the ongoing Maryland State Department of Education policy initiatives. Some of these include the

increase in graduation requirements leading to a need for more teachers to teach more courses, scholarship programs, a general rise in teacher salaries, and certification requirements to pass the National Teachers Examination.

The third factor is that it is widely believed that the rate of retirement will be significantly increased in the future due to the demographic aging of the teacher population. This factor has not yet been definitively documented but is currently being investigated.

VI. RESULTS AND FINDINGS

Tables of Data

The following tables represent data which were collected from several sources. In the Spring of 1986, personnel directors of Maryland's twenty-four local school systems were asked to provide actual figures on the number of their new teacher hires for the 1985-86 school year. They were also asked to project new hires for 1986-87, 1987-88, 1988-89, and 1989-90. Their responses were tabulated and statewide totals were determined. The information is not displayed by school systems because this study uses the State as its basic unit of analysis. Table 1 displays demand data by teaching field. Although these figures are estimates, previous predictions which were provided by the State's personnel directors have been relatively reliable. For example, for the Teacher Supply and Demand Study, 1985, personnel directors were asked in the spring to estimate their number of new hires for the fall. In a follow-up telephone survey, Maryland State Department of Education staff polled the personnel directors on the actual number of their fall teachers hires. The statewide total of the spring estimates was only 10% less than the statewide total of the actual hires. Table 2 displays the figures by school system.

In addition to requesting estimates of new hires from local personnel directors, MSDE staff requested estimates of spring graduates from the deans and

TABLE 1

ANTICIPATED DEMAND FOR NEW TEACHERS

	ACTUAL	PROJECTED			
	1985	1986	1987	1988	1989
EARLY CHILD.	263	311	361	385	396
ELEMENT. ED.	863	949	1014	1084	1088
TOTAL NURSERY-6	1126	1260	1375	1469	1484
ART K-6	40	35	37	35	28
ART 7-12	36	43	40	38	38
TOTAL ART	76	78	77	73	66
ENGLISH	201	217	212	220	225
JOURNALISM	0	0	1	1	1
SPEECH & DRAMA	2	1	2	1	2
TOTAL ENGLISH	203	218	215	222	228
FRENCH	22	36	35	42	24
GERMAN	6	6	6	6	6
LATIN	1	4	5	4	3
RUSSIAN	0	1	1	1	0
SPANISH	31	49	47	57	34
FOR. LANG. - OTHER	68	25	26	25	57
TOTAL FOR. LANG.	128	121	120	135	124
HEALTH	7	11	11	13	10
HOME EC.	34	36	36	35	38
INDUSTRIAL ARTS	26	36	28	39	37
MATHEMATICS	159	198	196	198	214
MUSIC GEN. K-6	9	11	14	13	14
MUSIC GEN. 7-12	32	45	50	48	50
MUSIC INST. K-6	3	6	10	6	7
MUSIC INST. 7-12	22	20	16	12	18
MUSIC VOC. K-6	19	18	18	17	14
MUSIC VOC. 7-12	14	19	19	16	19
TOTAL MUSIC	99	119	127	112	122
OUTDOOR ED.	0	0	2	0	0
PHYS. ED. K-6	14	29	32	30	29
PHYS. ED. 7-12	55	46	54	56	58
TOTAL PHYS. ED.	69	75	86	86	87

TABLE 1 (Cont'd)

ANTICIPATED DEMAND FOR NEW TEACHERS

	ACTUAL	PROJECTED			
	1985	1986	1987	1988	1989
BIOLOGY	15	26	33	36	37
CHEMISTRY	11	16	17	22	22
EARTH	12	16	16	21	16
GENERAL SCIENCE	26	44	45	52	45
PHYSICS	6	12	12	12	15
SCIENCE - OTHER	77	70	71	70	94
TOTAL SCIENCES	125	184	194	213	229
ECONOMICS	0	1	0	1	0
GEOGRAPHY	3	6	5	6	6
HISTORY	33	19	14	17	18
PSYCHOLOGY	0	2	1	1	1
SOCIAL STUDIES	73	76	76	84	91
SOCIOLOGY	0	0	1	0	0
SOC. SC. - OTHER	42	44	50	49	50
TOTAL SOC. SCIENCES	151	148	147	158	166
AGRICULTURE	4	1	4	4	4
BUSINESS ED.	31	58	53	54	57
DISTRIBUTIVE ED.	0	5	5	7	7
TRADES & INDUSTRY	25	56	50	50	45
VOCATIONAL - OTHER	11	7	7	5	7
TOTAL VOC-TECH	71	127	119	120	120
ED. MEDIA	58	67	61	64	59
SPECIAL ED. 0-3	27	53	59	64	57
SPECIAL ED. 1-8	227	245	258	268	267
SPECIAL ED. 6-12	263	235	242	258	230
HEARING IMPAIRED	8	17	21	24	15
SEVERELY HANDICAPPED	24	50	45	58	32
VISUALLY IMPAIRED	3	8	12	15	8
TOTAL SPECIAL ED.	552	608	637	687	609
ALL OTHER	72	80	79	80	59
GRAND TOTAL	2978	3366	3510	3704	3652

Revised 8/14/86

TABLE 2

TEACHER SUPPLY AND DEMAND
1985

COUNTY	ANTICIPATED NEW HIRES (estimate in Spring, 1985)	ACTUAL NEW HIRES (Based on telephone survey conducted in Fall, 1985)	CHANGE FROM ANTICIPATED	
Allegany	8	32	+ 24	
Anne Arundel	204	260	+ 56	
Baltimore City	354	333	- 21	
Baltimore	184	192	+ 8	
Calvert	26	29	+ 3	
Caroline	25	31	+ 6	
Carroll	70	64	- 6	
Cecil	60	53	- 7	
Charles	64	118	+ 54	
Dorchester	25	15	- 10	
Frederick	97	141	+ 44	
Garrett	15	18	+ 3	
Harford	136	147	+ 11	
Howard	110	200	+ 90	
Kent	11	20	+ 9	
Montgomery	517	664	+147	
Prince George's	565	369	-196	
Queen Anne'a	23	18	- 5	
St. Mary's	49	49	0	
Somerset	2	18	+ 16	
Talbot	13	22	+ 9	
Washington	53	57	+ 4	
Wicomico	34	47	+ 13	
Worcester	21	32	+ 11	
	2,666	2,929	+263	9%

directors of approved teacher education programs in Maryland. These data are sometimes referred to in the present report as "in-state pipeline." All twenty of the deans and directors of the state's approved college teacher preparation programs responded. The information which they provided is displayed in Table 4. The graduates are categorized by teaching field. Table 4 presents figures on actual graduates in 1984 and 1985 as well as figures on anticipated graduates for 1986, 1987, and 1988. These figures were collected before 1986 graduation took place at many of the institutions, so the 1986 data are considered "anticipated" rather than "actual." Cumulative figures for 1986-88 are displayed in the extreme right hand column.

In the past, projections of graduates which were provided by deans and directors have been at least as accurate as the estimates which were provided by directors of personnel. In 1985, their projections of graduates from all subject areas was only 8.4% less than the actual number of graduates. In other words, when deans were asked in February 1985 to estimate the number of students who would graduate from their programs in the spring, they supplied figures which were only 8.4% off from the figures which they supplied one year later in response to the question: how many students actually graduated last spring? Table 3 displays these figures.

Table 5 provides information by school district on the number of teachers in Maryland who were teaching on provisional certificates as of September 30, 1985. Provisional certificates are certificates which are issued to teachers who do not meet the criteria for a Standard Professional Certificate. They are issued at the request of the hiring agency. Certification guidelines state that they shall be issued only when a regularly certified candidate is not available for the position.

TABLE 3

* SUPPLY OF NEW TEACHERS: 1985 PROJECTED VS ACTUAL

	Projected	Actual	% Difference
Early Child/Element Ed.	485	523	+ 7.8%
Art	30	26*	*
English/Speech & Drama	52	62	+ 19.2%
Foreign Languages	10	19	+ 90.0%
Health	5	9	+ 80.0%
Home Economics	8	9	+ 12.5%
Industrial Arts	8	6	- 25.0%
Mathematics	35	36	+ 2.8%
Music	55	48	- 12.7%
Physical Education	54	55	+ 1.9%
Biology	39	47	+ 20.5%
Chemistry/Physics	3	2	- 33.3%
Earth/General Sciences	4	10	+150.0%
Social Sciences	40	49	+ 22.5%
Voc-Tech	18	22	+ 22.2%
Education Media	4	4	0%
Special Education	97	97	0%
All Other	1	1	0%
Total	948	1028	+ 8.4%

* Does not include the Maryland Institute - College of Art actual 1985 data, which might account for the difference between projected and actual Art teachers produced in Maryland.

* These statistics were provided by the deans and directors of teacher education programs in Maryland.

TABLE 4

SUPPLY OF NEW TEACHERS -

GRADUATES OF MARYLAND'S TEACHER EDUCATION PROGRAMS

	Actual		Anticipated			Cumulative
	1984	1985	1986	1987	1988	1986-1988
EARLY CHILDHOOD	185	207	229	260	279	768
ELEMENTARY EDUCATION	294	316	352	393	420	1165
TOTAL NURSERY-6	479	523	581	653	699	1933
ART K-6	8	1	2	2	2	6
ART K-12	5	3	4	4	5	13
ART K-12	22	22	19	19	16	54
TOTAL ART	35	26	25	25	23	73
ENGLISH	38	57	53	67	66	186
JOURNALISM	0	0	0	0	0	0
SPEECH & DRAMA	1	5	4	5	7	16
TOTAL ENGLISH	39	62	57	72	73	202
FRENCH	4	4	8	6	11	25
GERMAN	0	2	2	0	0	2
LATIN	0	0	0	2	0	2
RUSSIAN	0	0	0	1	0	1
SPANISH	4	13	17	14	18	49
FOREIGN LANG-OTHER	0	0	0	1	1	2
TOTAL FOREIGN LANG	8	19	27	24	30	81
HEALTH	5	9	8	8	8	24
HOME ECONOMICS	12	9	8	8	7	23
INDUSTRIAL ARTS	9	6	6	6	5	17
MATHEMATICS	21	36	50	58	62	170

TABLE 4 (CONTINUED)

	Actual		Anticipated			Cumulative
	1984	1985	1986	1987	1988	1986-1988
MUSIC GEN. K-6	0	0	0	0	0	0
MUSIC GEN. 7-12	1	1	12	0	0	0
MUSIC GEN. K-12	7	14	1	13	14	39
MUSIC INST. K-6	0	0	0	0	0	0
MUSIC INST. 7-12	0	0	0	1	0	1
MUSIC INST. K-12	23	21	21	32	32	85
MUSIC VOC. K-6	1	1	0	0	0	0
MUSIC VOC. 7-12	0	0	0	0	0	0
MUSIC VOC. K-12	18	11	12	16	17	45
TOTAL MUSIC	50	48	46	62	63	170
OUTDOOR EDUCATION	0	0	0	0	0	0
PHYS ED. K-6	0	0	0	0	0	0
PHYS ED. 7-12	13	3	4	3	4	11
PHYS ED. K-12	59	52	53	65	71	189
TOTAL PHYS ED.	72	55	57	68	75	200
BIOLOGY	34	47	47	59	64	170
CHEMISTRY	1	2	5	4	6	15
EARTH	4	1	1	6	9	16
GENERAL SCIENCE	2	9	15	27	39	81
PHYSICS	1	3	3	1	1	5
SCIENCE - OTHER	0	0	0	0	0	0
TOTAL SCIENCES	42	62	71	97	119	287
ECONOMICS	1	0	0	0	0	0
GEOGRAPHY	0	0	0	0	0	0
HISTORY	5	12	11	18	21	50
PSYCHOLOGY	1	0	0	1	0	1
SOCIAL STUDIES	23	37	37	50	52	139
SOCIOLOGY	0	0	0	1	0	1
SOC. SC. - OTHER	0	0	0	0	0	0
TOTAL SOC SCIENCES	30	49	48	70	73	191

TABLE 4 (CONTINUED)

	Actual		Anticipated			Cumulative
	1984	1985	1986	1987	1988	1986-1988
AGRICULTURE	1	5	2	2	3	7
BUSINESS EDUCATION	15	14	18	22	23	63
DISTRIBUTIVE EDUCATION	1	0	1	0	1	2
TRADES & INDUSTRY	0	3	2	1	1	4
VOCATIONAL - OTHER	0	0	1	0	0	1
TOTAL VOC-TECH	17	22	24	25	28	77
EDUCATION MEDIA	2	4	7	8	10	25
SPECIAL ED. 0-3	56	3	14	14	14	42
SPECIAL ED. 1-8	12	28	29	23	25	77
SPECIAL ED. 6-12	28	66	18	25	30	73
HEARING IMPAIRED	0	0	0	0	0	0
SEVERELY HANDICAPPED	4	0	4	7	7	18
VISUALLY IMPAIRED	0	0	0	0	0	0
TOTAL SPECIAL ED.	100	97	65	69	76	210
ALL OTHER	0	1	0	1	0	1
GRAND TOTAL	921	1028	1079	1254	1351	3684

TABLE 5

TOTAL CERTIFIED PROFESSIONAL STAFF AT SCHOOL LEVEL
BY TYPE OF CERTIFICATE
MARYLAND PUBLIC SCHOOLS: SEPTEMBER 30, 1985

LOCAL UNIT	TOTAL	PROFESSIONAL				PROVISIONAL			
		TOTAL NUMBER	PCT.	ADVANCED	STANDARD	TOTAL NUMBER	PCT.	DEGREE	NON-DEGREE
TOTAL STATE	43,391	42,910	98.9	35,809	7,101	481	1.1	416	65
ALLEGANY	727	726	99.9	662	64	1	0.1	1	0
ANNE ARUNDEL	4,074	4,064	99.8	3,449	615	10	0.2	7	3
BALTIMORE	5,853	5,838	99.7	5,331	507	15	0.3	7	8
CALVERT	482	480	99.6	385	95	2	0.4	1	1
CAROLINE	294	287	97.6	186	101	7	2.4	5	2
CARROLL	1,198	1,190	99.3	916	274	8	0.7	5	3
CECIL	781	779	99.7	576	203	2	0.3	2	0
CHARLES	1,007	986	97.9	708	278	21	2.1	21	0
DORCHESTER	326	323	99.1	280	43	3	0.9	1	2
FREDERICK	1,489	1,470	98.7	1,105	365	19	1.3	18	1
GARRETT	276	275	99.6	210	65	1	0.4	1	0
HARFORD	1,779	1,773	99.7	1,495	278	6	0.3	5	1
HOWARD	1,671	1,657	99.2	1,222	435	14	0.8	10	4
KENT	166	163	98.2	118	45	3	1.8	1	2
MONTGOMERY	6,647	6,581	99.0	5,435	1,146	66	1.0	64	2
PRINCE GEORGE'S	6,168	6,024	97.7	5,308	716	144	2.3	131	13
QUEEN ANNE'S	291	291	100.0	222	69	0	0.0	0	0
ST. MARY'S	747	736	98.5	535	201	11	1.5	11	0
SOMERSET	222	217	97.7	167	50	5	2.3	4	1
TALBOT	265	263	99.2	195	68	2	0.8	1	1
WASHINGTON	1,162	1,159	99.7	965	194	3	0.3	3	0
WICOMICO	729	723	99.2	592	131	6	0.8	2	4
WORCESTER	394	392	99.5	317	75	2	0.5	1	1
BALTIMORE CITY	6,643	6,513	98.0	5,430	1,083	130	2.0	114	16

Therefore the number of provisional certificates which are issued by a local school system is a fairly accurate indicator of the extent of the teacher shortage in that system. Recent State legislation which provides tuition assistance for students who subsequently teach in "geographic areas of extraordinary shortage" could use the number and proportion of issued provisional certificates as a guide to determining which geographic areas qualify for assistance. Table 5 suggests that Baltimore City (with 130 provisional certificates issued in 1985) and Prince George's County (with 144 provisional certificates issued in 1985) qualify as school systems with "extraordinary shortage." Figures for 1986 may be different due to the aggressive recruitment efforts which have been made by these two systems this year.

Provisional certificates are renewable yearly. The holder of such a certificate is required to take six credits per year toward completion of requirements for a regular certificate.

Tables 6, 7, 8, and 9 reflect the number of new hires for 1985-86, 1986-87, and 1987-88, and 1988-89 who have come or will come to teaching jobs in Maryland from various sources. These charts are organized by subject areas. They report how many and what proportions of new teachers who were hired during 1985-86 were from Maryland IHEs (i.e., the in-state pipeline), how many and what proportion came from non-Maryland IHEs (i.e., the out-of-state pipeline), and the numbers from non-Maryland sources). In Tables 7, 8, and 9, an estimate of the margin of error is provided in the column to the far right. These are 95% confidence intervals. For example, in Table 6, we estimate that 76% of the demand for Art teachers will be met by the supply. However, due to "error" in this estimate, we are 95% confident that the true percentage is plus or minus 10% (i.e., 66% - 86%). In Table 6, because it presents actual rather than projected figures, the

TABLE 6

ACTUAL SUPPLY AND DEMAND FOR 1985-86

Certification Area	Beginning Teachers MD IHE	Beginning Teachers Non-MD IHE	Experienced Teachers MD	Experienced Teachers Non-MD	Total New Hired 1985-86 (Supply)	Total Supply 1985-86	Total Demand New Hires 1985-86	Demand Minus Supply 1985-86	Percent of Demand 1985-86
Art	11	4	8	30	53	1080	76	23	70%
Business	2	6	4	12	24	970	31	7	77%
Elementary Education	173	180	131	520	1004	14564	1126	122	89%
English	14	35	13	76	138	2642	203	65	68%
Foreign Language	8	15	13	51	87	1102	128	41	*68%
Health/Physical Education	18	15	13	35	81	2403	76	-5	107%
Home Economics	0	2	3	20	25	798	34	9	74%
Industrial Arts	3	5	1	8	17	723	26	9	65%
Math	9	17	5	50	81	1825	159	78	*51%
Music	14	13	8	35	70	1604	99	29	71%
Science	13	24	6	60	103	2175	125	22	82%
Social Studies	18	28	10	55	111	2563	151	40	74%
Special Education	43	50	18	140	251	3000	552	301	*45%
Trades & Industry	0	0	0	3	3	572	25	22	*12%
Other Areas	2	9	4	37	52	3499	87	35	60%
Not Specified	29	41	47	30	147	589	-	-	-
TOTALS	357	444	284	1162	2247	40109	2898	803	78%

TABLE 7

SUPPLY AND DEMAND PROJECTIONS 1986-87

Certification Area	Returning From 1985-86	Beginning Teachers MD IHE	Beginning Teachers Non-MD IHE	Experienced Teachers MD	Experienced Teachers Non-MD	Total New Hired 1986-87 (Supply)	Total Supply 1986-87	Total Demand New Hires 1986-87	Demand Minus Supply 1986-87	Supply as Percent of Demand 1986-87	Error of Percent Estimate
Art	1027	11	5	9	34	59	1086	78	19	76%	+ 10%
Business	946	3	6	4	14	27	972	58	31	47%	± 13%
Elementary Education	13560	190	211	152	606	1159	14719	1260	101	92%	± 2%
English	2504	15	41	15	88	159	2663	218	59	73%	± 6%
Foreign Language	1015	11	17	14	59	101	1116	121	20	83%	± 7%
Health/Physical Education	2322	18	18	16	42	94	2416	86	-8	109%	-
Home Economics	773	1	2	3	22	28	801	36	8	78%	± 14%
Industrial Arts	706	4	6	2	9	21	727	36	15	58%	± 16%
Math	1744	13	20	7	55	95	1839	198	103	48%	± 7%
Music	1534	13	15	9	43	80	1614	119	39	67%	± 9%
Science	2072	15	28	7	70	120	2192	184	64	65%	± 7%
Social Studies	2452	14	36	13	71	134	2586	148	14	91%	± 5%
Special Education	2749	29	62	23	177	289	3038	608	319	48%	± 4%
Trades & Industry	569	0	0	0	3	3	572	56	53	5%	± 6%
Other Areas	3447	2	10	5	42	59	3506	93	34	63%	± 10%
Not Specified	442	34	48	55	34	171	613	-	-	-	
TOTALS	37862	373	525	334	1367	2599	40462	3299	879	79%	± 1%

TABLE 8

SUPPLY AND DEMAND PROJECTIONS 1987-88

Certification Area	Returning From 1986-87	Beginning Teachers: MD IHE	Beginning Teachers: Non-MD IHE	Experienced Teachers: MD	Experienced Teachers: Non-MD	Total New Hired 1987-88 (Supply)	Total Supply 1987-88	Total Demand New Hires 1987-88	Demand Minus Supply 1987-88	Supply as Percent of Demand 1987-88	Error of Percent Estimate
Art	1033	11	6	11	39	67	1100	77	10	87%	+ 8%
Business	949	3	7	5	15	30	979	53	23	57%	± 14%
Elementary Education	13705	215	242	176	681	1314	15019	1375	61	96%	± 1%
English	2524	17	46	16	101	180	2704	215	35	84%	+ 5%
Foreign Language	1028	10	20	17	67	114	1142	120	6	95%	± 4%
Health/Physical Education	2335	22	21	18	48	109	2444	99	-10	110%	-
Home Economics	776	1	2	4	24	31	807	36	5	86%	± 12%
Industrial Arts	710	3	8	1	12	24	734	28	4	86%	+ 13%
Math	1757	15	23	7	64	109	1866	196	87	56%	± 7%
Music	1544	18	16	10	45	89	1633	127	38	70%	± 8%
Science	2088	20	32	8	77	137	2225	194	57	71%	± 7%
Social Studies	2474	20	39	14	78	151	2625	147	-4	103%	-
Special Education	2784	30	71	27	199	327	3111	637	310	51%	± 4%
Trades & Industry	569	0	0	0	3	3	572	50	47	6%	± 7%
Other Areas	3454	2	12	5	47	66	3520	95	29	69%	± 9%
Not Specified	460	39	55	62	39	195	655	-	-	-	-
TOTALS	38190	426	600	381	1539	2946	41136	3449	712	85%	± 1%

TABLE 9

SUPPLY AND DEMAND PROJECTIONS 1988-89

Certification Area	Returning From 1987-88	Beginning Teachers MD IHE	Beginning Teachers Non-MD IHE	Experienced Teachers MD	Experienced Teachers Non-MD	Total New Hired 1988-89 (Supply)	Total Supply 1988-89	Total Demand New Hires 1988-89	Demand Minus Supply 1988-89	Supply as Percent of Demand 1988-89	Error of Percent Estimate
Art	1046	10	6	12	45	73	1119	73	0	100%	-
Business	955	3	8	5	17	33	988	54	21	61%	± 13%
Elementary Education	13984	231	262	198	778	1469	15453	1469	0	100%	-
English	2563	17	51	18	114	200	2763	222	22	90%	± 4%
Foreign Language	1052	13	22	18	75	128	1180	135	7	95%	± 4%
Health/Physical Education	2362	23	24	21	54	122	2484	99	-23	123%	-
Home Economics	782	1	3	4	26	34	816	35	1	97%	± 6%
Industrial Arts	717	2	9	2	14	27	744	39	12	69%	± 15%
Math	1783	16	24	7	68	115	1898	198	83	58%	± 7%
Music	1562	18	19	11	51	99	1661	112	13	88%	± 6%
Science	2119	25	35	9	86	155	2274	213	58	73%	± 6%
Social Studies	2511	21	41	15	81	158	2669	158	0	100%	-
Special Education	2851	33	80	30	222	365	3216	687	322	53%	± 4%
Trades & Industry	569	0	0	0	3	3	572	50	47	6%	± 7%
Other Areas	3457	2	13	6	52	73	3540	96	23	76%	± 9%
Not Specified	491	44	61	70	44	219	710	-	-	-	-
TOTALS	38804	459	658	426	1730	3273	42077	3640	609	90%	± 1%

estimate of error is not provided. It is interesting to note that the teaching fields with the lowest proportion of supply to demand in 1985-86 were Trades and Industry, Special Education, and Mathematics. In 1986-1987, Industrial Arts and Business Education are added to those three fields.

Table 10 provides the percentage of teachers for 1985-86 who came from in-state and out-of-state sources. Although Maryland has traditionally been an "Importer" State for purposes of teacher hiring, it is instructive to note that in fields like Special Education, fully 75% of Maryland's new teachers last year were from other states. Over four-fifths (82.7% and 81.6% respectively) of the Math and Science teachers came from out-of-state. More than 69.7% of new elementary school teachers came from out-of-state. They represent seven hundred new hires for that field. According to these figures, Maryland LEAs are highly depdendent upon other states to train and produce teachers for Maryland schools.

Table 11 provides a glimpse of the ratios of new hires in Maryland who are graduates of Maryland's institutions of higher education. These ratios are displayed by certification area. The figures provided in the "new hires" column represent new hires who are grsaduates of colleges and universities within the State.

Table 12 provides the number of teachers in Maryland school systems who retired in the 1985-86 school year. The column at the far right lists the percent of teaching staff which that year's retirees represents.

TABLE 10

NEW TEACHERS HIRED FOR 1985-1986 BY CERTIFICATION AREA

Certification Area	Beginning Teachers			Experienced Teachers			Total MD		Total Non-MD		Grand Total	
	MD IHE	Non-MD IHE	Total	MD	Non-MD	Total	N	%	N	%	N	%
Art	11	4	15	8	30	38	19	35.8	34	64.2	53	2.4
Business	2	6	8	4	12	16	6	25.0	18	75.0	24	1.1
Elementary Education	173	180	353	131	520	651	304	30.3	700	69.7	1004	44.7
English	14	35	49	13	76	89	27	19.6	111	80.4	138	6.1
Foreign Language	8	15	23	13	51	64	21	24.1	66	75.9	87	3.9
Health/Physical Education	18	15	33	13	35	48	31	38.3	50	61.9	81	3.6
Home Economics	0	2	2	3	20	23	3	12.0	22	88.0	25	1.1
Industrial Arts	3	5	8	1	8	9	4	23.5	13	76.5	17	.8
Math	9	17	26	5	50	55	14	17.3	67	82.7	81	3.6
Music	14	13	27	8	35	43	22	31.4	48	68.6	70	3.1
Science	13	24	37	6	60	66	19	18.4	84	81.6	103	4.6
Social Studies	18	28	46	10	55	65	28	25.2	83	74.8	111	4.9
Special Education	43	50	93	18	140	158	61	24.3	190	75.7	251	11.2
Trades & Industry	0	0	0	0	3	3	0	0	3	1.0	3	.1
Other Areas	2	9	11	4	37	41	6	11.5	46	88.5	52	2.3
Not Specified	29	41	70	47	30	77	76	51.7	71	48.3	147	6.5
TOTALS	357	444	801	284	1162	1446	641		1606		2247	
PERCENT	44.6	55.4	35.6	19.6	80.4	64.4		28.5		71.5		100.0

TABLE 11

* RATIO OF NEW HIRES TO GRADUATES
BY CERTIFICATION AREA 1985-86
FROM MARYLAND IHEs

CERTIFICATION AREA	NEW HIRES (From MD)	GRADUATES OF MD IHEs (Teacher Education)	RATIO
Art	11	26	42%
Business	2	14	14%
Elementary Education	173	523	33%
English	14	62	23%
Foreign Language	8	19	42%
Health/Physical Ed.	18	64	28%
Home Economics	1	9	10%
Industrial Arts	3	6	50%
Math	9	36	25%
Music	14	48	29%
Science	13	62	21%
Social Studies	18	49	29%
Special Education	43	97	44%
Trades & Industry	0	3	0%
Other Areas	2	6	33%
Not Specified	29	--	--

*The table does not indicate the proportional graduates hired the next year. The sum of the new hires had graduated from Maryland IHEs several years earlier.

TABLE 12

Retirees By LEA: Maryland Public Schools - 1985-86

Local Unit	Number of Teaching Staff	Percent of Teaching Staff
Total State	442	1.2
Allegany	13	2.0
Anne Arundel	35	1.0
Baltimore City	105	1.7
Baltimore	5	0.1
Calvert	0	0.0
Caroline	9	0.2
Carroll	4	0.4
Cecil	2	0.3
Charles	9	1.0
Dorchester	3	1.1
Frederick	16	1.2
Garrett	8	2.7
Harford	12	0.8
Howard	11	0.7
Kent	3	2.0
Montgomery	111	1.9
Prince George's	59	1.1
Queen Anne's	2	0.8
St. Mary's	3	0.5
Somerset	4	2.0
Talbot	1	0.4
Washington	16	1.6
Wicomico	11	1.7
Worcester	0	0.0

TABLE 13

CLASSROOM TEACHERS BY AGE CATEGORIES

	20-25 %	26-30 %	31-35 %	36-40 %	41-45 %	46-50 %	51-55 %	56 & over %
TOTAL STATE	4.1	9.2	19.0	24.8	17.5	10.9	8.3	6.1
Allegany	1.6	7.0	18.1	22.5	15.1	14.5	12.5	8.7
Anne Arundel	4.1	9.5	19.5	26.7	18.2	10.0	7.3	4.9
Baltimore City	2.0	6.0	20.4	25.2	16.5	11.6	10.3	8.0
Baltimore County	2.9	7.7	17.4	26.2	18.8	11.9	9.4	5.7
Calvert	4.5	17.1	25.0	21.9	16.2	6.4	6.7	2.2
Caroline	16.9	16.5	20.5	16.9	8.7	9.0	7.9	3.6
Carroll	6.3	15.1	23.0	23.2	14.7	8.4	4.9	4.5
Cecil	5.0	15.7	25.2	24.9	15.0	5.5	4.5	4.3
Charles	7.9	17.2	24.7	23.2	15.3	5.2	3.4	3.0
Dorchester	4.9	11.6	22.5	23.6	15.8	9.9	5.6	6.0
Frederick	10.4	15.4	21.4	22.4	14.4	8.0	4.8	3.2
Garrett	0.8	19.3	27.6	19.3	12.4	5.8	7.4	7.4
Harford	3.6	9.9	22.1	26.4	17.8	9.7	6.0	4.4
Howard	8.4	12.9	20.3	25.4	15.7	8.8	4.9	3.5
Kent	7.5	15.1	24.7	21.9	6.9	11.0	7.5	5.5
Montgomery	4.3	8.5	14.9	24.3	18.7	12.5	9.4	7.4
Prince George's	3.3	5.1	15.0	25.0	21.9	13.6	9.5	6.7
Queen Anne's	7.7	13.8	24.1	19.2	13.4	10.3	5.0	6.5
St. Mary's	7.3	18.3	24.2	19.9	14.1	9.5	3.7	2.9
Somerset	5.0	10.0	28.9	20.9	8.5	14.9	6.5	5.5
Talbot	7.4	16.5	22.2	24.8	12.2	6.5	4.8	5.6
Washington	3.5	9.5	23.0	25.7	13.6	8.5	8.5	7.7
Wicomico	2.7	10.1	21.0	22.4	18.3	8.5	10.1	6.9
Worcester	5.2	9.9	25.2	26.1	11.6	9.0	9.0	4.1

Summary of Findings:

According to data provided by personnel directors of the twenty four local education agencies in Maryland, the State will need 3299 new teachers for the 1986-87 academic year. About 79% of those positions will be filled from traditional sources (e.g., graduates of teacher education programs in Maryland and in other states, experienced teachers who have been living in Maryland but not teaching, and experienced teachers from other states). The remaining teachers (approximately 700) will have to be sought from other sources. In certain subject areas, the picture is rosy, but in others it is bleak. In Social Studies, for example, approximately 91% of Maryland's needs will be met through regular channels. In Special Education, however, only 48% of the vacancies will be filled by the usual combination of Maryland/non-Maryland graduates and the Maryland/non-Maryland "experienced" pool. If one defines "shortage area" as a teaching area which will require extraordinary recruitment and training efforts in order to meet the demand, Special Education may certainly be considered a shortage area for the 1986-87, 1987-88, and 1988-89 academic years. The figures for Mathematics are similar to those for Special Education. When it is understood that the percentages displayed in Tables 6 through 9 do not take into account the out-of-field teaching which is described in Table 12 or the issuance of provisional certificates (Table 5), it can be safely assumed that Special Education and Mathematics are two fields which require serious attention. Three teaching fields in Vocational-Technical Education: Trades and Industries, Business Education and Industrial Arts also appear to be shortage areas for the next several years. Although fewer teachers are needed in those categories than in fields such as Special Education and Mathematics, the supply/demand percentages indicate that policy-makers should look closely at those subject areas to determine whether or not they require

extra attention. It has been suggested that Vocational-Technical teaching fields are worthy of statewide recruitment and training efforts for at least two reasons: (1) it is difficult for school systems to compete with the lure of the private sector for these skilled professionals; (2) preliminary data reflect a high pool of pre-retirement age people among Maryland's teachers in Vocational-Technical fields. Overall, then, the present report implies that teacher supply, defined as the combination of new graduates from teacher education programs in Maryland and out-of-state and the pool of experienced teachers (from Maryland and out-of-state) who are likely to seek employment in Maryland will meet about 79% of the demand for new teachers in 1986-87, 85% of the demand in 1987-88, and 90% of the demand in 1988-89. Teaching fields, such as Special Education, Mathematics, and several of the Vocational-Technical fields will be in short supply. In fields such as English and Science, the supply/demand equation appears to give no cause for alarm; however, preliminary figures on misassignment reveal potential problems. In the next section, the implications of the data for the recruitment, training, certification, and retention of teachers will be explored.

VIII. RECOMMENDATIONS AND IMPLICATIONS

Recommendations for Future Studies:

It is recommended that future studies follow the same design as the current study. However, many definitions need to be significantly improved. These include definitions of teachers, new hires, and areas of certification.

Another recommendation relates to the use of time intervals and "as-of dates." These should be the same for both supply and demand and explicitly defined in the cover letter to the questionnaires which are distributed to personnel directors and deans.

Third, it is recommended that FTEs be used rather than "head counts". This would help the study produce statistics which are more consistent with other MSDE statistical releases and provide a more accurate picture of the full extent of supply and demand.

Finally, more data on the demographic characteristics of Maryland teachers would be helpful to include in next year's study. Thus, pre-retirement and retirement age teachers could be figured into projections of vacancies for future years.

Implications for Teacher Recruitment:

According to the figures which were provided to the writers of this report, recruitment activities within the state should consider the following:

(1) Critical Shortage Area Recruitment . The recruitment and training of teachers for the fields of Special Education, Mathematics, Trades and Industries, Business Education and Industrial Arts should be top priority. The most critical field appears to be Special Education because of the large number of

vacancies which are projected for that area and because of the high level of training (e.g., University of Maryland, College Park's program is now five years long) required. Mathematics is also critical because of the competing lure of private sector jobs for young people with mathematics ability. The three Vocational-Technical fields: Business Education, Trades and Industry, and Industrial Arts do not represent large numbers of vacancies, but they are areas which present unique challenges to recruiters. People who are trained in these fields can relatively easily secure employment outside of the classroom for higher salaries. More data on attrition rates and demographic characteristics of teachers in Business Education, Trades and Industries, and Industrial Arts are needed before a comprehensive recruitment plan may be developed. Recruitment efforts should, however, be targeted to this area.

(2) Potential Shortage Area Recruitment English is a subject area which appears to be taught frequently by misassigned teachers. If that continues to be the case, the recruitment of certified English teachers is also a priority for the State. Clearly, with the State's emphasis on basic skill development and oral/written fluency for students, teachers of English should be highly skilled professionals. Science, another area which is frequently, according to these data, taught out-of-field, should also be a focus of recruitment efforts because of the nature of the Science curriculum. Like Special Education and Mathematics, it is a teaching field which requres a broad, up-to-date knowledge base and methodological sophistication. In today's high-tech society, teachers of Science should be professionals with solid content preparation. Also, Science has been a critical shortage area in Maryland in the past, and Maryland IHEs continue to produce a very small number of graduates in certain Science Education fields. Note in Table 4, for example, that Maryland's deans and

directors of teacher education programs reported only two graduates in Chemistry in 1985 and five in 1986. They project four graduates in Chemistry in 1987 and five in 1988. In Earth Science and Physics, even fewer teachers were prepared. Note also that in Table 1, ninety-four Biology teachers will be needed in Maryland in 1986-1988; and one hundred and seventy will be produced by Maryland IHEs. Therefore, Biology is not an area for which scholarship asssistance is indicated. Maryland programs in Chemistry, Earth Science, and Physics, on the other hand, will only supply 27%, 30% and 15% (respectively) of the State's needs.

(3) Elementary Education In Elementary Education, recruitment activities should focus on quality as well as quantity. Although the pool of candidates for elementary teaching positions appears to be adequate (i.e. projected supply is about 90% of projected demand), the very large number of positions in that area make it worthy of attention. It is important to remember that although Tables 6, 7, and 8 suggest that Elementary Education teacher supply is not a serious problem, that conclusion is based upon the assumption that Maryland LEAs will continue to recruit about 70% of their elementary school teachers from out-of-state. If surpluses in other states begin to disappear, and/or local personnel officials seek to increase the proportion of hiring from in-state institutions, the supply/demand balance in Elementary Education may shift in the direction of shortage. Also, the effect of the "baby boomlet" on enrollment should be treated as a signal to keep the pool of high quality candidates in that field large. Finally, elementary school teachers are considered to be a very unreliable pool upon which to base staffing projections. The pool has a disproportionately large share of young women who leave jobs to get married, have children, and leave the area with their spouses. The increasing number of

non-teaching job opportunities for talented young women is also a factor which shrinks the projected pool of elementary teachers;

(4) Minorties Although this report does not provide an analysis of the race and ethnicity of Maryland teachers, national studies reveal a trend toward increased enrollments of racial and ethnic minorities with a corresponding decrease in the number of ethnic and racial minority applicants for teaching positions. Anecdotal information from administrators around the state suggests that Maryland is moving in a similar direction. In fact, the Maryland State Board for Higher Education is providing funds for institutions which recruit and retain minority students in teacher preparation programs. Targeted recruitment of minorities, therefore, should be another emphasis in this state.

In addition to the activities mentioned above, the State's teacher recruitment efforts could be beneficially directed toward facilitating collaboration among the local school systems. According to the data in this report, Maryland is heavily dependent upon an out-of-state pool of teachers to staff its schools. Each school system devotes a considerable amount of money to out-of-state recruitment. At a recent meeting of personnel directors, it was suggested that the Maryland State Department of Education could provide a valuable service to local systems by helping them to collaborate more cost-effectively on teacher recruitment activities. A statewide computerized printout listing vacancies throughout the state was one of the many suggestions at that meeting. State of Maryland teacher recruitment posters, brochures, and videotapes were also recommended. Initial experiments with a statewide advertising and referral system for teachers have been quite successful.

In sum, recruitment activities for the next few years should concentrate on finding shortage-area teachers (i.e, Special Education, Business Education,

Mathematics, Trades and Industry, and Industrial Arts), enlarging the pool of teachers in potential shortage areas (i.e, English, Science, and Elementary Education), proactive recruitment of minorities, and collaboration with local districts to make their recruitment efforts more cost-effective and to enhance the overall quality of Maryland's pool of teachers. Non-traditional pools of candidates: career changers, retirees, women who are re-entering the job market, and Liberal Arts graduates should be explored for recruitment purposes.

(5) Geographic areas of Extraordinary Shortage

According to demand data which was provided by personnel directors and certification information, provided by MSDE's date base, Baltimore City and Prince George's County are experiencing the greatest shortages of qualified teachers. As of September 30, 1985, Baltimore City had approximately 6,000 certified professionals in its system (including principals, guidance counselors, and other non-teaching, certified staff). One hundred and thirty of those people held provisional certificates. Prince George's County, a system of which is similar in size to Baltimore City, had one hundred and forty-four provisionals. These figures, especially for Prince George's County, may change as of September 30, 1986 (due to creative recruitment initiatives by those systems). However, it appears from the data that those two systems are the most appropriate candidates in the State for "areas of geographic shortage" aid. Note that the situations in Baltimore City and Prince George's County are consistent with those in urban areas in other states. Urban systems seem to be hit first and hardest by the latest trend in teacher shortage.

Implications for Teacher Education

The present study reveals a number of trends which have implications for State policy about teacher education. First of all, scholarship and tuition assistance should emphasize the areas of critical shortage: Special Education,

Mathematics, Business Education, Industrial Arts, and Trades and Industries. The second group of shortage areas, based on misassignment figures as well as supply and demand, consists of English and Science. Tuition assistance for students in those two teaching fields would contribute to the quality as well as the size of those pools of candidates. Although Elementary Education is not defined as a critical shortage area in this report, the nature of elementary school teachers should lead wise policy-makers to anticipate unpredictable swings in attrition and supply. In order to be prepared for those swings, the State should prepare more elementary teachers. It would benefit the State to direct some of its financial assistance to that group. Finally, minorities must be provided with "carrots" that entice them to enter teacher education programs in Maryland, to remain in those programs, and to teach for at least part of their careers in Maryland schools.

One finding of this study which has implications for teacher education programs in the State is the large proportion of teachers which are hired from other states. Although this situation is not new, in an era in which quality teaching is emphasized, the potential for quality control is greater when a larger proportion of beginning teachers are hired from the ranks of graduates of approved teacher education programs within the State. These programs are carefully monitored by the Maryland State Department of Education and the State Board for Higher Education. To become too highly dependent on an out-of-state pool, the quality of which is unknown and unpredictable, may be a dangerous matter. One of the anomalies of teacher supply and demand in this state is that colleges and universities within Maryland are preparing excellent teachers who are subsequently unable to find teaching positions in the state. At the same

time, local officials are recruiting large numbers of new beginning teachers from other states. Perhaps, more collaborative activity among Maryland LEAs and IHEs would address this anomaly.

Implications for Certification and Testing

The present report has several long-term implications for policy about teacher certification and teacher testing. First of all, teacher staffing in Maryland is not in a crisis situation. Although there are shortages in certain fields and potential shortages in others, a rapid response to crisis is not in order. Therefore, the establishment of quick (i.e., emergency) certification procedures is inappropriate. It is, however, appropriate to explore alternative paths toward certifiction which would maintain quality standards but broaden the base of teacher candidates within the State. Universitites and colleges should be encouraged to offer programs -- especially in shortage areas -- for the non-traditional candidate (i.e., the career changer, the retiree and the Liberal Arts graduate). These programs should be tailored to the mature student and should be intense and challenging. The programs should be approved by the State and should lead to regular (i.e., Standard Professional) certification for graduates. Some programs of this type have recently been started. The results, so far, have been gratifying. Programs have been over-subscribed. Apparently, large numbers of skilled and talented adults within the State would like to pursue careers in teaching. Although some of these people have been reluctant to seek certification in the past, the development of new training programs may attract the best and brightest of them into the profession.

In the first year of teacher testing, Maryland is in an ideal position to design a study of the impact of the National Teachers Examination on the size of its pool of teachers -- especially in critical shortage areas. Although there are no systematic data at this point which document the impact of the National

Teachers Examination on teacher supply and demand, several states (e.g, Virginia) are concerned about its potential impact, especially on the pool of ethnic and racial minorities. A State study which analyzes this impact after the first year or two of the determination of qualifying scores, should be helpful to policy-makers.

CONCLUSION

This report presents the results of an in-depth study of teacher supply and demand in the State of Maryland. The body of the report consists of seven parts: (1) a description of the purposes of the study; (2) a consideration of the limitations of the study; (3) a brief summary of national studies on teacher supply and demand; (4) a review of the supply and demand studies of several other states (e.g., Florida, California, Connecticut and Virginia) as well as previous Maryland studies; (5) a delineation of the methodology which was used, including assumptions, definitions, and data sources; (6) results and findings in the form of tables of data and interpretations of the data; and (7) recommendations and implications for the conduct of future studies and for policy in the areas of teacher recruitment, teacher education, teacher certification, and certification testing.

This year's study represents a significant improvement over prior attempts to collect supply and demand data in Maryland. The report is more comprehensive in its scope and includes a number of factors which previous reports did not, such as estimates of the number of new teachers who are hired from Maryland's pool of experienced teachers, the number of new teachers who are hired from the ranks of graduates of out-of-state colleges and universities, and the number of new teachers in Maryland who are experienced teachers hired from out-of-state. These figures permit a more precise assessment of teaching fields which will have shortages and the extent of the shortfall in those fields. It also gives policy makers a realistic picture of the various sources of teacher supply for

the State. The new Office of Management Information Systems (OMIS) data base of the Maryland State Department of Education provided much of the data for this report. It answers previously unanswered questions about teacher supply, teacher demand, and demographic information about teachers.

Based on the data which was collected from deans and directors of teacher education programs in Maryland, personnel directors of local school systems in the State, and MSDE's OMIS data base, several teaching fields will be shortage areas over the next four years (1986-1989). Special Education and Mathematics seem to be the most critical areas of shortage. Three Vocational Technical fields: Trades and Industry, Business Education, and Industrial Arts, also appear to be shortage areas. Shortages may re-emerge in Science, one of last year's critical shortage areas because of the small number of teachers of Chemistry, Physics, and Earth Sciences who are being produced by in-state teacher education programs and because of the challenging nature of the Science curriculum. Also, like mathematics, students with high aptitude for Science are being lured into private sector jobs which offer higher salaries than teaching. Science and English are also, according to preliminary OMIS data base figures, subjects which are frequently taught by misassigned teachers.

Elementary education is an area which is not in immediate danger of shortage but which deserves attention because of the predicted increase in elementary school enrollment over the next few years and because of the nature of the elementary teacher supply. A large proportion of elementary school teachers are young women who leave their positions for marriage, child bearing, child rearing, and relocation with spouses.

In sum, there is not a general crisis in teacher staffing in Maryland schools. However, there are teaching fields where supply is likely to be critically short of demand over the next few years. Although the overall pool

of graduates from Maryland college and university teacher education programs has shrunk in recent years, local school system recruiters have compensated for some of this shortfall by increased recruitment activities in other states. Unfortunately, the high proportion of new teachers who are being recruited from out-of-state may have a negative effect on the overall quality of Maryland's teaching force. Only 17% of the new Special Education teachers who were hired last year were graduates of Maryland's teacher education programs. Only 13% of the new Science teachers and 10% of the new English teachers were Maryland graduates (See Table 10). When this fact is coupled with the fact that many teacher education programs in Maryland enjoy national reputations for excellence and that two State agencies (MSDE and SBHE) are actively involved in program evaluation and program development activities in teacher education, it appears that a higher proportion of new teachers should be recruited from instate sources. Furthermore, recent publicity about the availability of teaching positions in the State has stimulated increased interest in teacher education programs, especially from students with "non-traditional" backgrounds.

The results of this study suggest a need for ongoing analysis of the complex issues surrounding teacher supply and demand. Continued and systematic coordination of recruitment, teacher education program approval, and data collection are necessary if Maryland policy-makers are to keep abreast of the facts and trends in this important area.